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**Permitting Strategy for Hanford
Site Research, Development,
and Demonstration Activities
for Treatment, Storage, or
Disposal of Hazardous Waste**

**Volume 1: Initial Conclusions
and Recommendations**

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September 1993

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
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Executive Summary

As part of the Hanford Site RCRA Permitting Strategy Project, the U.S. Department of Energy (DOE) and its contractors investigated permitting options for innovative technologies, and conducted a survey of technologies being investigated or developed, or proposed for investigation or development. The technology survey indicated several potential avenues to explore with the regulators to allow expeditious technology development and deployment, while still protecting human health and the environment. This survey is an ongoing activity.

This volume, Volume 1 of four volumes, provides detailed individual recommendations for regulatory interpretation and requests for rulemaking. Volume 2 contains Permit Options, Volume 3 contains Battelle Technology Summaries as of September 1993. Volume 4, Westinghouse Hanford Company (WHC) Technology Summaries, is being issued separately by WHC.

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1.0 Introduction

Successful remediation of the Hanford Site depends critically upon the development and implementation of innovative technology. Here at Hanford and elsewhere in the U.S. Department of Energy (DOE) complex, the regulatory framework is interwoven with Federal Facility Agreements which provide milestones for achieving cleanup goals and objectives. In many cases, achieving these milestones depends upon the development of technologies not yet invented.

This interim paper examines several of the permitting mechanisms in RCRA which are most critical to the research, development and demonstration (RD&D) of cleanup technologies at Hanford. It highlights impediments to effective application of these regulatory options and recommends solutions which will optimize the use of these options while protecting human health and the environment. These permitting options include the treatability exemption, RD&D permits, and innovative construction of full (Part B) RCRA permits.

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2.0 Treatability Study

2.1 Summary

The Resource Conservation and Recovery Act (RCRA) treatability study sample exemption (TSSE) allows the collection and use of sample hazardous wastes without a RCRA hazardous waste permit in support of studies to determine waste treatment requirements, process dynamics, and residue characteristics. The TSSE exemption is governed by the Washington Dangerous Waste Regulations (DWR) under the approved state RCRA program [WAC 173-303-071(r-s)]. The provision, however, is modeled on the U.S. Environmental Protection Agency (EPA) regulation [40 CFR 261.4 (e-f)], so the genesis of the federal regulation will be discussed as appropriate.

DOE is presently planning or conducting more than a dozen treatability studies at Hanford in support of various programs which include tank waste pretreatment and barrier technology. (Refer to Volume 3 - Battelle Technology Summaries). There will be an ongoing need to undertake numerous such studies in each successive generation of RD&D. The treatability study exemption is critical to the evolution of mature field technologies. This is because the time, cost, and scheduling problems associated with permitting procedures designed to govern large-scale, standardized processes, if applied to treatability studies, inhibits the ability to quickly investigate experimental treatment avenues and sort out competing technologies. Unless we can diligently pursue viable technologies at the experimental scale, we cannot clean up Hanford.

The DWR provide for limitations on the amount of sample materials that can be shipped, stored, and treated under the TSSE. There is also a limit on the amount that may be fed into all treatability studies at a testing facility in one day.

These quantity limits, especially as they bear upon definition of a "waste stream" from which waste samples may be obtained and the determination of what constitutes a "testing facility," are of particular concern at Hanford. The DWR quantity limits are shown below. Please see the table at the end of this document for a complete list of the state and proposed federal quantity limits.

- Shipment - 1,000 kg of "as received" dangerous waste, 1 kg of acutely hazardous waste, or 250 kg soils, water, or debris contaminated with acutely hazardous waste per shipment.
- Storage - 1,000 kg of dangerous waste, which may include 500 kg of soils, water, or debris contaminated with acutely hazardous waste or 1 kg of acutely hazardous waste may be stored at the testing facility.
- Treatment - 1,000 kg of dangerous waste, 250 kg of soils, water, or debris contaminated with acutely hazardous waste, or 1 kg of acutely hazardous waste may be treated for each waste stream

and for each treatment process. The entire testing facility is limited, however, to initiating treatment on no more than 250 kg of waste per day.

2.2 Waste Stream Definition

2.2.1 Relevant Provisions

The DWR limit TSSE treatment to 1000 kg of dangerous waste; 250 kg of soils, water, or soil contaminated with acutely hazardous waste; or 1 kg of acutely hazardous waste "for each process being evaluated for each generated waste stream." If designation of a "waste stream" is not based on the physical and chemical characteristics of the waste, investigation of a single process to determine its applicability to sample waste materials could be severely limited.

2.2.2 Discussion

When promulgating the original TSSE rule, EPA stated that it was "broadly defining 'waste stream' such that a waste stream and the quantity limit are not based on the EPA waste code alone, rather, the Agency will interpret and apply the quantity limit for each medium or physical form in which the waste stream appears." EPA stated that "broad interpretation (of 'waste stream') is necessary since each medium might require a different treatability study..." [53 FR 27294]. Although EPA was speaking of "media" in terms of soils, water, or debris, the significant point is the recognition that different waste forms may require different treatability studies. It is essential that the defining factor of a "single waste stream" for purposes of the TSSE be the physical and chemical characteristics of the tank waste (or other waste), which drives the treatability studies themselves and ultimate selection of the appropriate treatment technology. Considerations of economy, efficiency, and scientific integrity compel investigators to ultimately seek the minimum number of treatable waste streams in their investigations.

While it might be convenient to define a "single waste stream" in terms of an EPA waste code or in terms of a single waste site, pond, tank, or other physically convenient unit, a single Hanford waste source, however, may, in fact, contain several more or less distinct waste streams which differ significantly in their physical and chemical characteristics due to stratification, chemical interaction, migration, vintage, and other variables. A high cleanup priority at Hanford involves the 177 double-shell and single-shell tanks that together contain an estimated 340,000 metric tons of hazardous and radioactive wastes. These tanks were placed into service and filled throughout the almost 50 years of plutonium production on the reservation. In addition to containing wastes in liquid, solid, and semi-solid states, the contents of the tanks have evolved a chemical geography which varies not only horizontally but vertically throughout the tanks. These tanks will yield multiple waste streams, many of which may require different treatment and disposal processes.

Almost a dozen tank waste pretreatment studies are planned or under way at this time, and this number is expected to increase during the coming years. One such study, "Clean Salt" investigation of methods to recover inorganic salts from tank wastes, is slated to evaluate between 20 and 39 chemically distinct tank waste streams.

Recommendation: The definition of a waste stream, for purposes of the "treatment" quantity limitation of the TSSE, should be based upon the physical and chemical characteristics of the waste mixtures under investigation, and not upon EPA waste codes or common residence in a particular source unit. No rulemaking or modification of the Tri-Party Agreement (TPA) is necessary to implement this recommendation (R-1).

2.3 Facility Definition

2.3.1 Relevant Provisions

The DWR provide that the sample waste quantity limits apply in the aggregate to all treatability study sample materials at a single testing facility. This is of concern here at Hanford, since under the TPA Hanford is considered a single RCRA facility and has been assigned a single EPA number. If sample quantity limitations were to be applied to Hanford as a whole, it would pose a severe, unintended restriction on the number of such studies that can be conducted at the many laboratories and locations across the reservation.

2.3.2 Discussion

There is nothing in the TPA to suggest that Hanford, though one *RCRA facility*, is to be considered a single *testing facility* for purposes of the TSSE. Looking to the regulations themselves, it is clear that the term "laboratory or testing facility," which is used repeatedly in the preamble and the regulation, was not intended to be synonymous with the RCRA definition of "facility." When promulgating the TSSE, EPA explicitly stated that the receiving facility, though it must have an EPA ID number, need not have a RCRA permit or be on interim status [53 FR 27292]. Thus, Hanford RD&D contractors could send a sample to an offsite testing facility, and the quantity limits would apply only to the treatability studies under way at that offsite testing facility itself. This indicates that the term "laboratory or testing facility" refers to the actual laboratory or building in which the study is undertaken, not a unit or aggregation of units governed by a single RCRA permit.

The regulation does contemplate aggregation of testing facilities in the specific instance of multiple Mobile Treatment Units (MTUs) operating at one location. However, it is clear from the preamble that this provision was intended to address the special problems associated with multiple small units whose size and mobility presents special potential for accountability problems and abuse.

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The quantity limits established by the TSSE are intended to prevent any attempt to treat commercial quantities of waste without a permit, or attempts to store such materials improperly, and to protect human health and the environment. Each of the active laboratories, experimental facilities, and sites at Hanford are governed by appropriate health and safety plans and are subject to materials inventory controls. These individual units each constitute a testing facility within the meaning of the exemption and are each fully qualified to meet the goals of the TSSE quantity limits.

Recommendation: For purposes of the Treatability Study Sample Exemption, each physical laboratory, whether it is a building or a discrete sub-unit of a building dedicated to analytical and experimental activities, or MTUs operating at one location, and which are governed by an appropriate health and safety plan, should be considered a "laboratory or testing facility" within the meaning of the DWR TSSE. No rulemaking or modification of the TPA is necessary to implement this recommendation (R-2).

2.4 Quantity Limits

2.4.1 Relevant Provisions

The DWR TSSE quantity limits are discussed above. EPA proposes to raise the quantity limits for the federal rule (see table at the end of this document); if Washington followed suit it would materially promote the development of innovative technology at Hanford.

2.4.2 Discussion

EPA included quantity limits in the original exemption in order to ensure that the provision would not be used for commercial treatment, storage and disposal and to reduce the risk to human health and the environment associated with handling large volumes of hazardous material. The high cost of treatability studies and the huge volumes of waste material here at Hanford and at the other remediation programs most likely to conduct such studies are themselves sufficient to prohibit commercial misuse of the exemption. In addition, substantially larger volumes can be safely managed by existing means without significant incremental risk. (The 250-kg use limit for soil contaminated with acute hazardous waste, for instance, represents less than one fifth cubic meter of saturated soil.)

Many of the planned studies at Hanford require waste volumes which are modest in comparison to commercial scale activities but which exceed the existing limits. For instance, Pacific Northwest Laboratory's (PNL's) Nitrem Chemistry study would involve 800 kg of sample waste (see Volume 3 - Battelle Technology Summaries).

The 250-kg daily use limit, which governs aggregate treatability studies under way at a single testing facility, may require serial scheduling of major treatability investigations, especially if they

involve continuous feed processes. This increases the time required to evaluate competing technologies and scale up to the next level of investigation.

The 500-kg storage limit results in increased transportation at the cost of time and manpower. Retrieval and transportation of hazardous and radioactive waste is best accomplished in the fewest operations and trips possible to minimize exposure, scheduling conflicts, and expense.

EPA has proposed raising some of the most significant limits by a factor of 10 (see Volume 3 - Battelle Technology Summaries). Raising these limits will materially facilitate the development of innovative technologies at Hanford for application there and at other cleanup sites around the nation. Hanford contractors support this proposal, and will be providing detailed comments in response to the Notice of Proposed Rulemaking.

EPA's proposed changes, however, apply only to soils and debris contaminated with hazardous waste. This limitation could severely undercut the benefits of the expanded quantity limits at the Hanford Site, particularly in regard to tank wastes. EPA is proposing higher limits on contaminated soil and debris because it believes that the incremental risk associated with the management of solid materials is low. RD&D activities at Hanford, however, also target high priority waste streams which are in liquid or slurry form. Treatability studies on fluid tank wastes, for instance, are among the most essential RD&D activities under way at the reservation. These radioactive mixed wastes can be handled in quantities significantly higher than the existing limits without posing a significant incremental risk to public health or the environment. Retrieval, transportation, and storage of these materials would take place primarily within the boundaries of the reservation under a high degree of oversight. Equipment requirements and handling protocols necessary to reduce the likelihood of release are well established.

Recommendation: Quantity limits should be raised by EPA and the state of Washington in order to facilitate the development of innovative technologies and their application at Hanford and elsewhere, pursuant to the current EPA proposed rulemaking. Subsequent state rulemaking would be necessary to implement this recommendation (R-3).

Recommendation: Quantity limits should also be increased for tank wastes, pursuant to the current EPA proposed rulemaking. Subsequent state rulemaking would be necessary to implement this recommendation (R-4).

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3.0 RD&D Permits

3.1 Summary

The RD&D permit is designed to allow innovative and experimental technologies to be developed for hazardous waste treatment. These permits limit operation times and waste types to that required to successfully demonstrate the technology. In some cases, it might be advantageous to aggregate several technology investigations into a single RD&D permit to decrease the administrative burden and increase efficiency within both regulatory and research operations.

3.2 Issues

3.2.1 Relevant Provisions

The 40 CFR 270.65(a)(1) allows the construction of "such facilities as necessary" indicating that multiple operations might be permitted within the scope of a single RD&D permit. In addition, the Office of Solid Waste and Emergency Response (OSWER) Policy Directive, July 1986, *Guidance Manual for Research, Development, and Demonstration Permits under 40 CFR 270.65*, on page 6-2, states that "one RD&D permit can authorize testing of several different and unrelated technologies or processes."

3.2.2 Discussion

Several programs are ongoing at the Hanford Site which might require RD&D permitting. One example is the Tank Waste Remediation System, which is currently undergoing technology development in areas such as retrieval and pretreatment. Although several activities are under way in different locations, in some cases it would be more efficient to permit the program as an RD&D activity, rather than permit each activity individually. Permitting several activities together reduces the administrative burden of putting numerous applications together, reduces the amount of time the regulators (and other reviewers) must spend reviewing the applications and preparing permits, avoids extensive redundant iterations of similar project descriptions, and allows for a single operating log to determine the number of operating days for the aggregated technologies.

The single operating log assumes that, as identified in the OSWER Guidance Manual, the one-year permit length is not a calendar year, but a year of operational days. We assume that operation of different technologies (within the same RD&D permit) on the same day will constitute only one day of operation; we intend to maintain an operational log for all technologies to determine actual days of operation, allowing 360 days of operation prior to permit expiration or renewal, and ensuring compliance with permit conditions. This will allow the most flexibility in meeting Hanford's technology development needs and cleanup requirements.

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Recommendation: RCRA RD&D permits should be written on a programmatic basis rather than individual project basis, where sensible, in order to achieve more efficient administration of permit requirements (R-5).

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4.0 RCRA Part B Permit

4.1 Summary

The Part B permit is designed to provide detailed operational requirements that protect human health and the environment. It is generally appropriate for particular operations that can be characterized as ongoing, routine operations; however, in some cases, changes to permit units are allowable without a lengthy modification process. This modification process is detailed in WAC 173-303-830. The Part B permit process is generally not viewed as appropriate for research and development activities, since these activities are generally characterized as short term, that require frequent changes to optimize process efficiencies and test different technologies. However, the potential for useful combinations of research activities into a Part B permit should be explored.

There are several dedicated RD&D buildings within the Hanford Site, such as Buildings 324 and 325. These buildings house numerous different experiments from several different programs, including Tank Waste Pretreatment activities, various melter technologies, soil heating, and others. These and other projects are ongoing or planned within these buildings. An alternative to permitting each of these individually or programmatically under the RD&D permit scheme is to permit the building as a Part B TSD facility. The Part B permit modification process has been cited as an impediment to research operations because of the lengthy time required for public comment on the modifications.

4.2 Issues

4.2.1 Relevant Provisions

Modifications to TSD permits require, at a minimum, notification to the regulator and interested parties; many modifications require regulatory approval prior to implementation. Some modifications (Class 1) do not require public comment periods. Class 2 and 3 modifications require a minimum 60-day public comment period, and allow between 30 to 60 days to review the comments. These modifications are listed in Appendix I to WAC 173-303-830; however, this listing is not exclusive. Modifications that are not specifically listed may be processed as a Class 3 modification, requiring public comment and regulator review and approval, or may be processed as a Class 1 or 2 modification with Washington State Department of Ecology approval [WAC 173-303-830(4)(d)(i)].

Ecology approval depends on the similarity of the modifications to other modifications listed in Appendix I and to additional criteria listed in WAC 173-303-830(4)(II). These additional criteria state that Class 1 modifications apply to minor changes that do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health and the environment. Additionally, Appendix I classifies some treatment process modifications as Class 1 modifications. Specifically, these are listed in Appendix I, Sections F.1.c and G.1.e. These modifications to treatment processes

are allowable to treat wastes which are restricted from land disposal, "or to treat wastes to satisfy (in whole or in part) the standard of 'use of practically available technology that yields the greatest benefit'."

4.2.2 Discussion

There are large quantities of Hanford wastes for which there are no available treatment and disposal technologies, including wastes such as the Hanford tank wastes and other mixed wastes. Much of the research under way is to develop technologies that will treat a currently untreatable waste stream. Most of this technology development is ongoing within buildings that have extensive safety systems in place, in which different technologies and permutations of technologies are tested to develop solutions to Hanford Site treatment requirements.

Changing technologies or modifying processes to test efficiency rates does not result in a reduction of the building capacity to protect human health and the environment, and does not alter the character of the building as a research facility. EPA, in its OSWER RD&D Guidance Manual, recognized that government-owned laboratories may be testing numerous technologies, and indicated that they could be permitted as an RD&D facility, acknowledging that the one year RD&D permit time limit applies. However, they implied that the RD&D process might not be as effective due to the time limit, stating that they were developing a regulation to permit laboratory facilities (see page 6-7 of the manual). In the absence of that regulation, permitting research buildings under the RCRA Part B scheme may be appropriate.

Recommendation: Ecology should allow particular research buildings, or portions of those buildings, to be permitted as Part B TSD facilities, writing specific permit provisions that ensure proper health and safety controls and that allow experimental changes to technologies and processes to proceed as Class 1 modifications, requiring prior Ecology approval under WAC 173-303-830(4)(a)(ii)(R-6).

In addition, there is the need to recognize that some technologies, particularly at the pilot scale, may be developed at TSD units also conducting more traditional, operational activities. In these cases, the following recommendation is made.

Recommendation: If a TSD unit has a Part B permit, and is conducting both operational and technology activities, the technology activities should be covered by specific permit provisions that ensure proper health and safety controls and that allow experimental changes to technologies and processes to proceed as Class 1 modifications, requiring prior Ecology approval under WAC 173-303-830(4)(a)(ii)(R-7).

5.0 Conclusion

Additional issues are under investigation. The Parties need to develop a realistic, flexible and cohesive strategy which will make possible the achievement of tangible results while satisfying the purpose and substance of state and federal regulations.

Following is a table showing selected quantity limits under Washington regulations and the higher limits proposed by EPA in their notice of proposed rulemaking dated July 7, 1993 (58 FR 36367).

Table: Treatability Study Quantity Limits Comparison of Washington State and Proposed Federal Limits

Activity	Quantity Limit ^(a) EPA/WA		Proposed Limits EPA ^(b)	
Shipping	1000 kg DaW ^(c)	250 kg SWDAHW ^(d)	10000 kg HW ^(e)	2500 kg SDAHW ^(f)
Storage	1000 kg DaW	500 kg SWDAHW	10000 kg HW	2500 kg SDAHW
Treatment ^(g)	1000 kg DaW	250 kg SWDAHW	10000 kg HW	2500 kg SDAHW
Additional	500 kg DaW	250 kg SWDAHW	NA	
Daily Input	250 kg		10000 kg HW	2500 kg SDAHW

(a) Acutely Hazardous Waste Quantity Limit = 1 kg for all categories. This figure is not shown on the table.

(b) Washington limits are the same as current EPA limits, except as regards additional request amounts allowable by Ecology for "state only" wastes.

(c) DaW = (Non-Acutely Hazardous) Dangerous Waste ("DW" has a specific narrower meaning under the WAC, which is not relevant here.)

(d) SWDAHW = Soils, water or debris contaminated with Acutely Hazardous Waste.

(e) HW = EPA Non-Acute Hazardous Waste. This classification is roughly comparable to Washington "dangerous waste" (not DW).

(f) SDAHW = Soil or Debris contaminated with Acute Hazardous Waste.

(g) Per waste stream per process.

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